

## REVIEW: Ratios and Proportions

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ratio: a comparison between two numbers with the same units

e.g. If an engine runs on a mixture of gas and oil and needs 15L of gas for every 1 L of oil, the ratio of gas to oil is

15 to 1 or 15:1 or  $\frac{15}{1}$

*the order matters!*

Ratios can be part-to part ratios (comparing different parts of a group to each other) or part-to-whole ratios (comparing one part of a group to the whole group).

Ratios are typically simplified.

e.g. 20:16 or  $\frac{20}{16}$   
 $\div 2 \leftarrow 2$   
 $\div 2 \leftarrow 2$   
10:8  
 $\div 2 \leftarrow 2$   
5:4 or  $\boxed{\frac{5}{4}}$

### Example

A recipe for vegetarian chili contains:

56 oz of tomatoes

30 oz of kidney beans

15 oz of corn

a. What is the ratio of corn to kidney beans?

$\div 15 \leftarrow$  15:30  
1:2

b. What is the ratio of tomatoes to kidney beans?

$\div 2 \leftarrow$  56:30  $\rightarrow \div 2$   
28:15

### You Try

At the Dry Grad Car Wash, 15 sedans, 25 mini-vans, 10 SUVs and 5 pick-up trucks were washed.

- a. What is the ratio of sedans to mini-vans?

$$\div 5 \begin{cases} 15:25 \\ \boxed{3:5} \end{cases} \text{ or } \boxed{3 \text{ to } 5} \text{ or } \boxed{\frac{3}{5}}$$

- b. What is the ratio of SUVs to pick-up trucks?

$$\div 5 \begin{cases} 10:5 \\ \boxed{2:1} \end{cases} \text{ or } \boxed{2 \text{ to } 1} \text{ or } \boxed{\frac{2}{1}}$$

- c. What is the ratio of sedans to all the other vehicles combined?

$$\div 5 \begin{cases} 15:40 \\ \boxed{3:8} \end{cases} \text{ or } \boxed{3 \text{ to } 8} \text{ or } \boxed{\frac{3}{8}}$$

~~25~~  
10  
5  

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55  
40

proportion: **a statement that says two ratios are equivalent** (=)

*or rates*

- e.g. If an engine twice the size of the one above needs the same mixture of gas and oil, it will need 30 L of gas for 2 L of oil.

The ratio of gas to oil is still the same.

The following proportion shows this equality:

$$15:1 = 30:2$$

$$\frac{15}{1} = \frac{30}{2}$$

Notice:

$$\cancel{\frac{15}{1} = \frac{30}{2}}$$

$$15 \times 2 = 1 \times 30$$

$$30 = 30$$

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### Example

The Polars basketball team won 2 out of every 3 games they played this season. They played 45 games. How many games did they win?

Set up a proportion

$$\begin{array}{l} \text{wins} \rightarrow \frac{2}{3} = \frac{x}{45} \\ \text{games played} \end{array}$$

$$\begin{aligned} 2 \times 45 &= 3 \times x \\ \frac{90}{3} &= \frac{3x}{3} \\ 30 &= x \end{aligned}$$

They won 30 games

### Example

Tom and Susan make \$180.00 from holding a garage sale. Because Susan contributed more items to the sale, the money is to be divided between Tom and Susan in the ratio of 1:2. How much money will each person receive?

Tom ↗ ↖ Susan

$$\begin{aligned} \text{total shares} &= 1 + 2 \\ &= 3 \end{aligned}$$

total money = \$180

$$\begin{array}{l} \text{Tom} \rightarrow \frac{1}{3} = \frac{x}{180} \\ \text{total} \end{array}$$

$$\begin{aligned} x &= \frac{1 \times 180}{3} \\ &= \$60 \text{ to Tom} \end{aligned}$$

$$\begin{array}{l} \text{Susan} \rightarrow \frac{2}{3} = \frac{x}{180} \\ \text{total} \end{array}$$

$$\begin{aligned} x &= \frac{2 \times 180}{3} \\ &= \$120 \text{ to Susan} \end{aligned}$$

### You Try

A big-screen TV has an aspect ratio of 16:9, which means that for every 16 inches of width, the TV is 9 inches high. What is the height of a TV that is 40 inches wide?

$$\begin{array}{l} w \rightarrow \frac{16}{9} = \frac{40}{x} \\ h \rightarrow \end{array}$$

$$\begin{aligned} x &= \frac{9 \times 40}{16} \\ &= 22.5 \end{aligned}$$

The TV is 22.5 inches high